Claims

1. A wire bonder comprising:

a processor;

a bond head coupled to the processor, the processor being configured to control motion of the bond head;

a bonding tool mounted to the bond head, the bonding tool being drivable by the bond head to form an electrical interconnection between a semiconductor die and a substrate to which the semiconductor die is mounted using a bonding wire; and

a measuring device coupled to the bond head, the measuring device being operable to measure a deformation of a bonding portion of the bonding wire as the bonding tool is driven by the bond head to connect the bonding wire to the semiconductor die via the bonding portion,

wherein the processor is configured to

derive at least one correlation between the measured deformation of the bonding portion and an operating parameter of the wire bonder;

compare the at least one derived correlation against a predetermined correlation between the operating parameter of the wire bonder and a desired deformation of the bonding portion; and

calibrate the operating parameter of the wire bonder based on the comparison between the at least one derived correlation and the predetermined correlation of the deformation of the bonding portion against the operating parameter of the wire bonder.

2. The wire bonder of claim 1, wherein the processor is configured to calibrate the operating parameter of the wire bonder by a conversion factor.

3. The wire bonder of claim 1, wherein the operating parameter of the wire bonder is an ultrasonic current delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

4. The wire bonder of claim 1, wherein the operating parameter of the wire bonder is a bond force delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

5. The wire bonder of claim 1, wherein the operating parameter of the wire bonder is a deformation setting of the bonding portion.

6. The wire bonder of claim 5, wherein the deformation setting comprises a combination of an ultrasonic current and a bond force, both of which are operatively delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

7. The wire bonder of claim 1, wherein the operating parameter of the wire bonder is a vibratory setting of an XY table of the wire bonder.

8. The wire bonder of claim 1, wherein the measuring device is a position encoder.

9. The wire bonder of claim 8, wherein the position encoder is configured to measure the deformation of the bonding portion along a vertical axis.

10. A method of calibrating a wire bonder, the wire bonder comprising a processor, a bond head, a bonding tool drivable by the bond head to form an electrical interconnection between a semiconductor die and a substrate to which the semiconductor die is mounted using a bonding wire; and a measuring device operable to measure a deformation of a bonding portion that is formed at the bonding wire as the bonding tool is driven by the bond head to connect the bonding wire to the semiconductor die via the bonding portion, the method comprising the steps of:

deriving at least one correlation between the measured deformation of the bonding portion and an operating parameter of the wire bonder;

comparing the at least one derived correlation against a predetermined correlation between the operating parameter of the wire bonder and a desired deformation of the bonding portion; and

calibrating the operating parameter of the wire bonder based on the comparison between the at least one derived correlation and the predetermined correlation of the deformation of the bonding portion against the operating parameter of the wire bonder.

11. The method of claim 10, wherein the step of calibrating the operating parameter of the wire bonder includes the use of a conversion factor.

12. The method of claim 10, wherein the operating parameter of the wire bonder is an ultrasonic current delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

13. The method of claim 10, wherein the operating parameter of the wire bonder is a bond force delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

14. The method of claim 10, wherein the operating parameter of the wire bonder is a deformation setting of the bonding portion.

15. The method of claim 14, wherein the deformation setting comprises a combination of an ultrasonic current and a bond force, both of which are delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

16. The method of claim 10, wherein the operating parameter of the wire bonder is a vibratory setting of an XY table of the wire bonder.

17. The method of claim 10, wherein the measuring device is a position encoder.

18. The method of claim 17, wherein the step of deriving the at least one correlation between the measured deformation of the bonding portion and the operating parameter of the wire bonder comprises using the position encoder to measure the deformation of the bonding portion along a vertical axis.

Claims

1. A wire bonder comprising:

a processor;

a bond head coupled to the processor, the processor being configured to control motion of the bond head;

a bonding tool mounted to the bond head, the bonding tool being drivable by the bond head to form an electrical interconnection between a semiconductor die and a substrate to which the semiconductor die is mounted using a bonding wire; and

a measuring device coupled to the bond head, the measuring device being operable to measure a deformation of a bonding portion of the bonding wire as the bonding tool is driven by the bond head to connect the bonding wire to the semiconductor die via the bonding portion, wherein the measuring device is configured to measure the deformation of the bonding portion along a vertical axis;

wherein the processor is configured to

derive at least one correlation between the measured deformation of the bonding portion and an operating parameter of the wire bonder;

compare the at least one derived correlation against a predetermined correlation between the operating parameter of the wire bonder and a desired deformation of the bonding portion; and

calibrate the operating parameter of the wire bonder based on the comparison between the at least one derived correlation and the predetermined correlation of the deformation of the bonding portion against the operating parameter of the wire bonder.

2. The wire bonder of claim 1, wherein the processor is configured to calibrate the operating parameter of the wire bonder by a conversion factor.

3. The wire bonder of claim 1 or claim 2, wherein the operating parameter of the wire bonder is an ultrasonic current delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

4. The wire bonder of any one of the preceding claims, wherein the operating parameter of the wire bonder is a bond force delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

5. The wire bonder of any one of the preceding claims, wherein the operating parameter of the wire bonder is a deformation setting of the bonding portion.

6. The wire bonder of claim 5, wherein the deformation setting comprises a combination of an ultrasonic current and a bond force, both of which are delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

7. A wire bonder comprising:

a processor;

a bond head coupled to the processor, the processor being configured to control motion of the bond head;

a bonding tool mounted to the bond head, the bonding tool being drivable by the bond head to form an electrical interconnection between a semiconductor die and a substrate to which the semiconductor die is mounted using a bonding wire; and

a measuring device coupled to the bond head, the measuring device being operable to measure a deformation of a bonding portion of the bonding wire as the bonding tool is driven by the bond head to connect the bonding wire to the semiconductor die via the bonding portion,

wherein the processor is configured to

derive at least one correlation between the measured deformation of the bonding portion and an operating parameter of the wire bonder;

compare the at least one derived correlation against a predetermined correlation between the operating parameter of the wire bonder and a desired deformation of the bonding portion; and

calibrate the operating parameter of the wire bonder based on the comparison between the at least one derived correlation and the predetermined correlation of the deformation of the bonding portion against the operating parameter of the wire bonder;

wherein the operating parameter of the wire bonder is a vibratory setting of an XY table of the wire bonder.

8. The wire bonder of any one of the preceding claims, wherein the measuring device is a position encoder.

9. A method of calibrating a wire bonder, the wire bonder comprising a processor, a bond head, a bonding tool drivable by the bond head to form an electrical interconnection between a semiconductor die and a substrate to which the semiconductor die is mounted using a bonding wire; and a measuring device operable to measure a deformation of a bonding portion that is formed at the bonding wire as the bonding tool is driven by the bond head to connect the bonding wire to the semiconductor die via the bonding portion, the method comprising the steps of:

deriving at least one correlation between the measured deformation of the bonding portion and an operating parameter of the wire bonder;

comparing the at least one derived correlation against a predetermined correlation between the operating parameter of the wire bonder and a desired deformation of the bonding portion; and

calibrating the operating parameter of the wire bonder based on the comparison between the at least one derived correlation and the predetermined

correlation of the deformation of the bonding portion against the operating parameter of the wire bonder;

wherein the measuring device is configured to measure the deformation of the bonding portion along a vertical axis.

10. The method of claim 9, wherein the step of calibrating the operating parameter of the wire bonder includes the use of a conversion factor.

11. The method of claim 9 or claim 10, wherein the operating parameter of the wire bonder is an ultrasonic current delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

12. The method of any one of claims 9 to 11, wherein the operating parameter of the wire bonder is a bond force delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

13. The method of any one of claims 9 to 12, wherein the operating parameter of the wire bonder is a deformation setting of the bonding portion.

14. The method of claim 13, wherein the deformation setting comprises a combination of an ultrasonic current and a bond force, both of which are delivered from the bond head to form the electrical interconnection between the semiconductor die and the substrate.

15. A method of calibrating a wire bonder, the wire bonder comprising a processor, a bond head, a bonding tool drivable by the bond head to form an electrical interconnection between a semiconductor die and a substrate to which the semiconductor die is mounted using a bonding wire; and a measuring device operable to measure a deformation of a bonding portion that is formed at the bonding wire as the bonding tool is driven by the bond head to connect the

bonding wire to the semiconductor die via the bonding portion, the method comprising the steps of:

deriving at least one correlation between the measured deformation of the bonding portion and an operating parameter of the wire bonder;

comparing the at least one derived correlation against a predetermined correlation between the operating parameter of the wire bonder and a desired deformation of the bonding portion; and

calibrating the operating parameter of the wire bonder based on the comparison between the at least one derived correlation and the predetermined correlation of the deformation of the bonding portion against the operating parameter of the wire bonder

wherein the operating parameter of the wire bonder is a vibratory setting of an XY table of the wire bonder.

16. The method of any one of claims 9 to 15, wherein the measuring device is a position encoder.

17. The method of claim 16, wherein the step of deriving the at least one correlation between the measured deformation of the bonding portion and the operating parameter of the wire bonder comprises using the position encoder to measure the deformation of the bonding portion along a vertical axis.